REMARKS/ARGUMENTS

Applicants thank the Examiner for the interview granted March 18, 2009. The rejection under 35 U.S.C. §103 was discussed. No agreement was reached.

Claims 21-30 and 41-45 are pending in the present application. No claims were canceled; no claims were amended; and no claims were added. Reconsideration of the claims is respectfully requested.

I. 35 U.S.C. § 103, Obviousness

The examiner has rejected claims 21-30 and 42-45 under 35 U.S.C. § 103(a) as being unpatentable over *Quincke* (U.S. Patent No. 6,345,231) (hereafter "*Quincke*") in view of *Keller* (U.S. Patent No. 6,199,000) (hereafter "*Keller*"). This rejection is respectfully traversed.

A. Independent Claim 21

Claim 21 is directed towards a method for guiding a vehicle. In the method, a work area is divided into cells. Elevation data and corresponding location data is established for the work area divided into cells. A location data, which includes a particular location of a vehicle, is determined within the work area. At least one of roll data and pitch data is estimated corresponding to the particular location. The roll data is associated with a corresponding lateral slope and the pitch data is associated with a corresponding longitudinal slope. The roll and pitch data are separately estimated using a maximum slope of the ground with respect to a reference point for each cell traversed by the vehicle corresponding to the particular location and an aspect angle between a direction of the maximum slope and an axis with which the direction of travel is coincident. The maximum slope has a non-zero longitudinal slope component and a non-zero lateral slope component. The vehicle steering is guided in a direction of travel with compensation data based upon at least one of the estimated roll data and pitch data such that an actual path of the vehicle follows a target path.

The reference fails to teach or suggest all of the features of claim 21. For example, the proposed combination of references, considered as a whole, does not teach or suggest at least the features of: 1) wherein each of the roll data and pitch data are separately estimated using i) a maximum slope of ground with respect to a reference point for each cell traversed by the vehicle

corresponding to the particular location, and the maximum slope having a non-zero longitudinal slope component and a non-zero lateral slope component, and ii) an aspect angle between a direction of the maximum slope and an axis with which a direction of travel is coincident and 2) guiding the vehicle steering in a direction of travel with compensation data based upon at least one of the estimated roll data and the pitch data such that an actual path of the vehicle follows a target path.

The Examiner disagrees, stating:

- Regarding claim 21, Quincke discloses a method of guiding a vehicle, the method comprising:
    - determining location data, including a particular location of a vehicle, within the work area; [Xp, Yp, Zp; Col. 3, line 24]
    - estimating at least one of roll data ["α"] and pitch data ["β"] corresponding to the particular location [Col. 3, lines 10-24], the roll data associated with a corresponding lateral slope [Col. 3, lines 19-22], the pitch data associated with a corresponding longitudinal slope generally perpendicular to the lateral slope, wherein each of the roll data and pitch data are separately estimated using
        - i) a maximum slope of ground ["α" or "β'] with respect to a reference point [Xp, Yp, Zp] for each cell traversed by the vehicle corresponding to the particular location, and the maximum slope having a non-zero longitudinal slope component [Col. 9, lines 7-20] and a non-zero lateral slope component [Col. 8, line 60 - Col. 9, line6], and
        - ii) an aspect angle between a direction of the maximum slope and an axis with which a direction of travel is coincident [Quincke discloses alignment angle φ which is in the N-S-E-W plane, and therefore the aspect angle φ will be between the two directions claimed];
    - guiding the vehicle steering in a direction of travel with compensation data based upon at least one of the estimated roll data and the pitch data such that an actual path of the vehicle follows a target path [Col. 9, lines 32-65]

but fails to disclose:

- establishing elevation data and corresponding location data for a work area divided into cells;

Keller also teaches an agricultural vehicle which uses high-precision differential GPS to plant crops. Keller further teaches that his device uses GIs data of where seeds will go in the field [Col. 7. lines 56-67]. Keller teaches in Fig. 1,that the GIS data includes a grid broken up into cells [Fig. 1, "base map"] and includes an elevation layer [Fig. 1: "elevation"] Therefore, "establishing elevation data and corresponding location data for a work area divided into cells" would have been obvious to one skilled in the art (e.g. a robotics engineer) at the time the invention

was made, for the advantage of guiding a planter along a hill as taught in Keller in Figs. 5 and 8.

Office Action dated December 31, 2008, pages 3-4.

The Examiner bears the burden of establishing a *prima facie* case of obviousness based on prior art when rejecting claims under 35 U.S.C. § 103. *In re Fritch*, 972 F.2d 1260, 23 U.S.P.Q.2d 1780 (Fed. Cir. 1992). The prior art reference (or references when combined) must teach or suggest all the claim limitations. *In re Royka,* 490 F.2d 981, 180 USPQ 580 (CCPA 1974). In determining obviousness, the scope and content of the prior art are... determined; differences between the prior art and the claims at issue are... ascertained; and the level of ordinary skill in the pertinent art resolved.

Against this background the obviousness or non-obviousness of the subject matter is determined. *Graham v. John Deere Co.*, 383 U.S. 1 (1966). "Often, it will be necessary for a court to look to interrelated teachings of multiple patents; the effects of demands known to the design community or present in the marketplace; and the background knowledge possessed by a person having ordinary skill in the art, all in order to determine whether there was an apparent reason to combine the known elements in the fashion claimed by the patent at issue." *KSR Int'l. Co. v. Teleflex, Inc.*, No. 04-1350 (U.S. Apr. 30, 2007). "Rejections on obviousness grounds cannot be sustained by mere conclusory statements; instead, there must be some articulated reasoning with some rational underpinning to support the legal conclusion of obviousness." Id. (citing *In re Kahn*, 441 F.3d 977, 988 (CA Fed. 2006)).

Claim 21, is as follows:

21. (Previously Presented) A method of guiding a vehicle, the method comprising:

establishing elevation data and corresponding location data for a work area divided into cells;

determining location data, including a particular location of a vehicle, within the work area;

estimating at least one of roll data and pitch data corresponding to the particular location, the roll data associated with a corresponding lateral slope, the pitch data associated with a corresponding longitudinal slope generally perpendicular to the lateral slope, wherein each of the roll data and pitch data are separately estimated using i) a maximum slope of ground with respect to a reference point for each cell traversed by the vehicle corresponding to the particular location, and the maximum slope having a non-zero longitudinal slope component and a non-zero lateral slope component, and ii) an aspect angle between a direction of the maximum slope and an axis with which a direction of

travel is coincident;

guiding the vehicle steering in a direction of travel with compensation data based upon at least one of the estimated roll data and the pitch data such that an actual path of the vehicle follows a target path.

A.1. The proposed combination of references, considered as a whole, fails to teach or suggest the feature of, "wherein each of the roll data and pitch data are separately estimated using i) a maximum slope of ground with respect to a reference point for each cell traversed by the vehicle corresponding to the particular location...and ii) an aspect angle between a direction of the maximum slope and an axis with which a direction of travel is coincident."

The proposed combination of references, considered as a whole, fails to teach or suggest the feature of, "wherein each of the roll data and pitch data are separately estimated using i) a maximum slope of ground with respect to a reference point for each cell traversed by the vehicle corresponding to the particular location...and ii) an aspect angle between a direction of the maximum slope and an axis with which a direction of travel is coincident." The Examiner disagrees and cites to *Quincke* at column 9, lines 7-20 to teach a maximum slope of ground with respect to a reference point for each cell traversed by the vehicle corresponding to the particular location, which states:

Traveling in the N-S Direction on a Slope Inclined Transversely to the Longitudinal Direction of the Equipment (cf. FIG. 7)

$$\begin{bmatrix} X_p \\ Y_p \\ Z_p \end{bmatrix} = \begin{bmatrix} X_A \\ Y_A \\ Z_A \end{bmatrix} + \begin{bmatrix} d_3\sin(\beta_0+\beta) & 0 & 0 \\ 0 & 5 & 0 \\ 0 & 0 & -d_3\cos(\beta_0+\beta) \end{bmatrix} \begin{bmatrix} 1 \\ 1 \\ 1 \end{bmatrix}$$

$$\begin{bmatrix} X_p \\ Y_p \\ Z_p \end{bmatrix} = \begin{bmatrix} X_A + d_3\sin(\beta_0+\beta) \\ Y_A + 5 \\ Z_A - d_3\cos(\beta_0+\beta) \end{bmatrix}$$

This cited portion of *Quincke* teaches calculating a location. Specifically, *Quincke* teaches calculating a location when traveling in the N-S direction on a slope inclined transversely to the longitudinal direction of the equipment. However, from this equation, *Quincke* does not teach or suggest a maximum slope of the ground with respect to a reference point for each cell traversed by the vehicle corresponding to a particular location. *Quincke* is completely devoid of teaching a maximum slope of the ground. Futhermore, *Quincke* does not teach or suggest a

maximum slope with respect to a reference point for each cell. The above matrix equation gives no indication as to what the symbols represent. Additionally, the matrix equations above result in three number, Xp, Yp, and Zp. Since the matrix equation results in a point on a map (X, Y, Z), this would not even allow an estimation of pitch and roll data as in claim 21. The Examiner has misinterpreted claim 21. The Examiner equates β with roll data and X, Y, and Z with the reference point in claim 21. Even assuming, in *arguendo*, that the assumptions by the Examiner are true, *Quincke* would teach using the roll data to determine a reference point. *Quincke* would still not teach using the maximum slope, which is not taught in *Quincke* at all, for each cell to estimate the roll and pitch data. To further understand the equation, Figure 7 of *Quincke* is as follows:

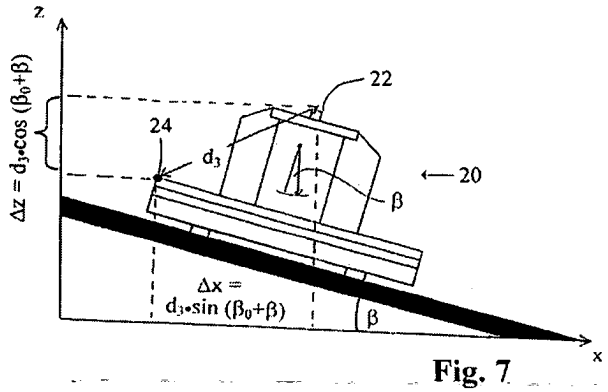

Fig. 7

Figure 7 of *Quincke* gives meaning to the symbols used in the matrix equation above. The symbol β describes the angle between the x axis and the slope of the ground where the vehicle in *Quincke* is located. *Quincke* teach away from using a maximum slope of the ground with respect to a reference point for each cell traversed by the vehicle corresponding to a particular location in estimating roll and pitch data. In *Quincke*, the symbol β is the roll angle of the vehicle in Figure 7 and not the angle of the maximum slope used to estimate roll and pitch data in claim 21.

The Examiner further states that *Quincke* "discloses alignment angle Φ which is in the N-S-E-W plane, and therefore the aspect angle Φ will be between the two directions claimed," to teach or suggest an aspect angle between a direction of the maximum slope and an axis with which a direction of travel is coincident is used in estimating pitch and roll data, as in claim 21. To further understand the angle Φ, column 3, lines 55-58 and 66-67 of *Quincke* is as follows:

> d.sub.1 the projection of the distance (D; distance from the location of the GPS antenna 22 to the reference point 24) onto the horizontal plane (x,y) of the reference system,

.phi..sub.0 the angle between d.sub.1 and the N-S direction (x-direction),

This portion of *Quincke* teaches the meaning of the angle Φ. The angle Φ is the angle between d1 and the N-S direction. D1 is the projection of the distance from the location of the GPS antenna to the reference point. Therefore, the angle Φ in *Quincke* is the angle between the direction of the reference point and the N-S direction. Figure 2 of *Quincke* shows the angle Φ for further clarification:

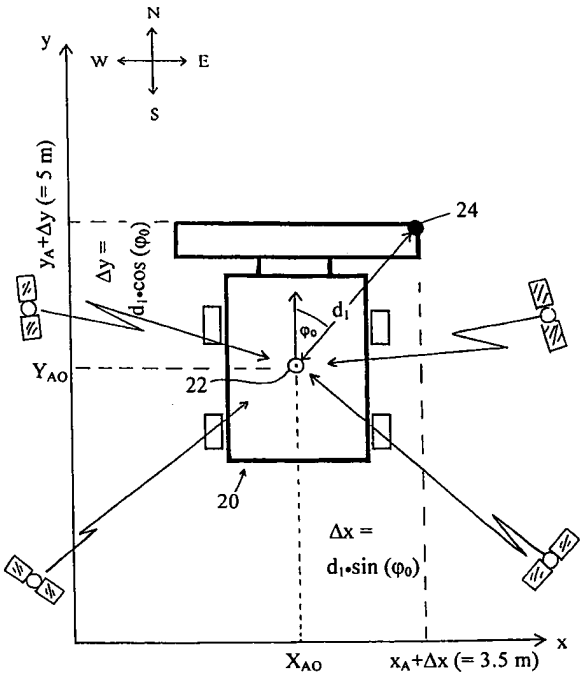

Fig. 2

Figure 2 of *Quincke* shows the angle Φ. The angle Φ in *Quincke* is not the same as the aspect angle in claim 21. The aspect angle in claim 21 is the angle between a direction of the maximum slope and an axis with which a direction of travel is coincident. Even if, in *arguendo*, the axis with which a direction of travel is coincident is the same as the N-S direction, *Quincke* teaches away from claim 21 by using the direction of the reference point as the other vector and not the direction of the maximum slope. Furthermore, *Quincke* does not teach or suggest using this angel to estimate pitch and roll data. Therefore, *Quincke* does not teach or suggest all of the features of claim 21.

Additionally, *Keller* does not teach or suggest the features of claim 21 which *Quincke* fails to teach or suggest, nor does the Examiner assert that *Keller* does. Therefore, for at least the reasons stated above, the proposed combination of references, considered as a whole, does not teach or suggest all of the features of claim 21. Therefore, this rejection is overcome.

A.2. The proposed combination of references, considered as a whole, fails to teach or suggest the feature of, "guiding the vehicle steering in a direction of travel with compensation data based upon at least one of the estimated roll data and the pitch data such that an actual path of the vehicle follows a target path."

The proposed combination of references, considered as a whole, fails to teach or suggest the feature of, "guiding the vehicle steering in a direction of travel with compensation data based upon at least one of the estimated roll data and the pitch data such that an actual path of the vehicle follows a target path." The Examiner disagrees and cites to *Quincke* at column 9, lines 32-65 to teach this feature, which states:

> Furthermore, it is provided that when the processing unit AWE finds a virtual reference point 40, it takes into consideration at least one parameter of the equipment 20, such as the speed of travel, so that the position of the virtual reference point relative to the satellite reception unit (GPS antenna) can be regulated dynamically as a function of at least one parameter. This is shown with reference to the speed of travel in FIGS. 9 and 10. It is thus possible to travel at a higher speed in this way, looking further ahead, so to speak.
>
> Furthermore, it is provided that whenever the reference point, which is ahead in the direction of travel, has reached the end of the field (which can be determined with a stored field register, for example) certain operations (e.g., lifting cutterbar 26, lifting and turning plow) are triggered automatically with an adjustable time lag.
>
> Further, it is provided that at least one position parameter (relative angle of bending of the trailer to the tractor, relative height of a three-point hitch, relative feeder housing angle, etc.) of a cultivation tool mounted on the equipment is taken into consideration by the processing unit AWE, so that the position of the virtual reference point 40 relative to the satellite reception unit (GPS antenna 22) can be regulated dynamically as a function of this parameter as shown in FIG. 12. In FIG. 11, for example, is shown a tractor 30 with a fertilizer spreader 32. Here it is provided that the position of the virtual reference point is made dependent on the speed of rotation of the spreader plates 34, 36 or the working width of the spreader, so that the reference point 40 is in each case located at the edge of the spreading range. In order that the theoretical working width can be determined

even more accurately, the position parameters of the three-point hitch are also taken into consideration when calculating the reference point.

The cited portion of *Quincke* teaches that a when a processing unit finds a virtual reference point, it takes into consideration a parameter of the equipment, such as speed, so that the position of the virtual reference point relative to a satellite reception unit (GPS antenna) can be regulated dynamically as a function of the parameter. When the reference point has reached the end of the field, certain operations are triggered automatically with an adjustable time lag. The certain operations could be lifting a cutterbar or lifting and turning the plow. Alternatively, in *Quincke* the parameter may be a cultivation tool mounted on the equipment to form the virtual reference point. The virtual reference point may be in each case located at the edge of a spreading range. However, the cited portion of *Quincke* is completely devoid of guiding the vehicle steering in a direction of travel with compensation data based upon at least one of the estimated roll data and the pitch data such that an actual path of the vehicle follows a target path. The cited portion of *Quincke* has nothing to do with the steering of a vehicle. In contrast, the cited portion of *Quincke* is directed towards a virtual reference point which is used in conjunction with a satellite to determine when operations need to be triggered. At best, *Quincke* is guiding the vehicle when *Quincke* determines that the plow needs to be turned, but this is not based on roll or pitch data. Additionally, *Quincke* does not teach or suggest a target path, but merely determines when an operation needs to be triggered. Therefore, *Quincke* does not teach or suggest all of the features of claim 21.

Additionally, *Keller* does not teach or suggest the features of claim 21 which *Quincke* fails to teach or suggest, nor does the Examiner assert that *Keller* does. Therefore, for at least the reasons stated above, the proposed combination of references, considered as a whole, does not teach or suggest all of the features of claim 21. Therefore, this rejection is overcome.

B. Dependent Claims 22-30 and 42-45

Dependent claim 22-30 and 42-45 depend upon claim 21. Therefore, for at least the same reasons that proposed combination of references does not each or suggest all of the features of claim 21, the proposed combination of references does not teach or suggest all of the features of claims 22-30 and 42-45 at least because of their dependence on claim 21. Therefore, the rejection of claims 21-30 and 42-45 under 35 U.S.C. § 103(a) has been overcome.

Additionally, claims 22-30 and 42-45 contain additional features not taught or suggested by the proposed combination of references. For example, the proposed combination of references, considered as a whole, does not teach or suggest the feature of, "wherein the estimating comprises estimating the roll data based on one of more of the following: location data, elevation data, a current position of the vehicle, an expected position of the vehicle, vehicle speed, vehicle heading, vehicular velocity, and a path plan," as in claim 29. The Examiner disagrees and cites to *Quincke* at column 9, lines 33-42 to teach this feature, which states:

> Furthermore, it is provided that when the processing unit AWE finds a virtual reference point 40, it takes into consideration at least one parameter of the equipment 20, such as the speed of travel, so that the position of the virtual reference point relative to the satellite reception unit (GPS antenna) can be regulated dynamically as a function of at least one parameter. This is shown with reference to the speed of travel in FIGS. 9 and 10. It is thus possible to travel at a higher speed in this way, looking further ahead, so to speak.

The cited portion of *Quincke* teaches that a when a processing unit finds a virtual reference point, it takes into consideration a parameter of the equipment, such as speed, so that the position of the virtual reference point relative to a satellite reception unit (GPS antenna) can be regulated dynamically as a function of the parameter. However, the cited portion does not teach or suggest estimating the roll data. The reference point in *Quincke* is not the same as roll data. A virtual reference point is just that, a point, and not data about the roll of a vehicle.

Additionally, the proposed combination of references, considered as a whole, does not teach or suggest the feature of, "wherein a size of each of the cells is less than or equal to a length of the vehicle," as in claim 44. The Examiner disagrees and cites to column 1, line 17 of *Quincke*, which states:

> In this case meanwhile satellite navigation systems such as differential global positioning (DGPS) are available with suitably efficient evaluation units which achieve accuracy of position finding, i.e., finding the position of a GPS antenna, to within a centimeter.

This portion of *Quincke* states that satellite navigation system can achieve accuracy of position finding. These units can find the position of a GPS antenna to within a centimeter. *Quincke* teaches a location (position). However, *Quincke* does not teach or suggest a size of each cell. At best, *Quincke* teaches the size of a location found by a DGPS unit. The reference and claim 44

are teaching two completely different features. *Quincke* is teaching the accuracy of a differential global positioning system while claim 44 is directed towards the size of each cell.

II. 35 U.S.C. § 103, Obviousness – Claim 41

The examiner has rejected claim 41 under 35 U.S.C. § 103(a) as being unpatentable over *Quincke* and *Keller* and in further view of *Stewart* (NPL). This rejection is respectfully traversed.

Claim 41 depends upon claim 21. The Examiner does not assert that *Stewart* teaches or suggests any of the features of claim 21 not taught or suggested by *Quincke* in view of *Keller.* Therefore, for at least the same reasons that proposed combination of references does not each or suggest all of the features of claim 21, the proposed combination of references does not teach or suggest all of the features of claim 41 at least because of its dependence on claim 21. Therefore, the rejection of claim 41 under 35 U.S.C. § 103(a) has been overcome.

III. Conclusion

It is respectfully urged that the subject application is patentable over the cited references and is now in condition for allowance.

The Examiner is invited to call the undersigned at the below-listed telephone number if in the opinion of the Examiner such a telephone conference would expedite or aid the prosecution and examination of this application.

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Respectfully submitted,

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